New information on the *Nesospiza* buntings at Inaccessible Island, Tristan da Cunha, and notes on their conservation

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Tristan and Wilkins' Buntings *Nesospiza acunhae* and *N. wilkinsi* are endemic to Inaccessible and Nightingale Islands in the remote Tristan da Cunha archipelago, central South Atlantic Ocean. Visits by ornithologists to these islands, particularly Inaccessible, have been infrequent and brief, allowing for the collection of specimens but only limited field studies (Moseley 1892, Wilkins 1923, Broekhuysen & Macnae 1949, Hagen 1952, Elliott 1957, Richardson 1984). In consequence, the life histories of the buntings are poorly known. Both species are listed as 'Rare' in the *Red Data Book* (Part 1, Collar & Stuart 1985). We here present the results of observations made on these birds while we were members of the Denstone Expedition to Inaccessible in 1982–83 (Swales *et al.* 1985).

Study site and methods

Inaccessible (37°15′S, 12°30′W) is the second largest island of the Tristan da Cunha group, with a planar area of 13 km^2 (P. G. Ryan, *contra* Siddall 1985). Its biota and human history are described by Wace & Holdgate (1976), Richardson (1984) and Fraser *et al.* (1988) and references therein. The island is uninhabited and is rarely visited by Tristan islanders. We were present on Inaccessible Island between 14 October and 23 December 1982, and 21 January and 10 February 1983.

Observations were made of Tristan Buntings in a 1 ha site at Blenden Hall, a gently sloping landslip at sea level on the west coast of the island (locations of place names are given by Siddall 1985). The vegetation here is dominated by *Spartina arundinacea* tussock-grass up to 3·0 m tall, with patches of ferns *Blechnum penna-marina* and sedges. Scattered individuals and clumps of Island Tree *Phylica arborea* occur nearby. A small perennial stream runs through the area. Twenty buntings, including four breeding pairs, were uniquely colour-ringed. Measurements to the nearest 0·5 mm were made with stopped rule and dividers; masses were recorded to the nearest 0·1 g with a 50 g Pesola spring balance. Nest watches totalling 21·7 h were made of nest-building by one pair at their first and first replacement nests. The incubation and nestling stages were monitored at other nests, for 44·3 h and 30·2 h, respectively. Nest watches covered all daylight hours and averaged 1·5 h (range 0·3–9·8 h; $n = 77$).

Unless otherwise specified, data on the Tristan Bunting were collected at the Blenden Hall study site, where the duller-plumaged 'lowland' form (see Morphology, below) occurs. Opportunistic observations were made on the island plateau (300–500 m a.s.l.), where *Spartina* tussock is

relatively scarce and the vegetation is dominated by tree ferns *Blechnum palmiforme* and *Phylica*.

Wilkins' Buntings were mistnetted and ringed/colour-ringed at a small *Phylica* grove ('Wilkins' Copse') at Skua Bog, Blenden Hall. Observations of this, by far the rarer of the two buntings at Inaccessible, were otherwise confined to chance encounters elsewhere at Blenden Hall and on the island plateau.

Tristan Bunting

Habitat and population size

The Tristan Bunting occurs in all habitats at Inaccessible, but appeared to be most abundant on the tussock-clad coastal slopes and forelands. The Blenden Hall study site held seven breeding pairs per hectare (*contra* M. W. Fraser, in Collar & Stuart 1985), and a variable number of non-breeding and subadult birds. Densities in other habitats appeared lower but were not quantified. However, we estimated from our general observations that the population was at least 5000 birds, and probably much more. It is not possible to infer any population changes from the two previous estimates (the 'thousands' of Hagen (1952) and Richardson's (1984) 500–1000 pairs), but the species has invariably been recorded as abundant on Inaccessible.

General habits

Tristan Buntings occur singly or in pairs. They forage in both open and densely-vegetated areas, on the ground or on tussock seedheads. In *Phylica* woodland they forage on bark, in the foliage or amongst lichens on the limbs and trunks of the trees. They frequent the tussock/beach interface and debris at the highwater line and forage amongst exposed boulders at low tide.

The buntings are fairly approachable (they can be caught by long-handled net, but not by hand). They rarely actively approached humans, nor displayed the strong curiosity which characterised Tristan Thrushes *Nesocichla eremita* at Inaccessible.

Food

The diet of Tristan Buntings was not quantified, but in the coastal lowlands the birds appeared to feed mainly on *Spartina* seeds. Here they also ate other vegetable matter including fruits of *Empetrum* and *Nertera*. Caterpillars were occasionally fed to nestlings. Small marine molluscs were taken on the beaches. Stomach contents recorded by Hagen (1952) and Richardson (1984) comprised at least three types of seed, six insects and one other arthropod.

Territoriality

Breeding males sang from traditional conspicuous, elevated song posts such as tall tussock or *Phylica* bushes whence they also pursued other birds in apparent territorial disputes or accompanied the female to the nest. The males also rested and preened (including over-wing head-scratching) on these perches. Observations of chases between birds

were not quantified or related to stage of breeding season, but appeared frequent between adult males and less frequent between adult males and subadults. The high densities of nests and birds at Blenden Hall were such that the exclusion of other birds from even a small territory was probably impossible. Females were observed chasing subadult birds and other adult females. An incubating female occasionally left her nest to pursue a female which had flown over the nest site.

Breeding season and schedule

Active nest-building was first recorded on 25 October, but a nest with eggs, found on 28 October, indicated that nest-building was underway earlier in that month. Eggs are laid as soon as the nest is complete. The breeding season is protracted, clutches being found as late as 22 January (a fifth breeding attempt by a colour-ringed pair) and 4 February.

Four colour-ringed pairs at Blenden Hall built one, two, four and five successive nests, respectively, between 25 October and 22 January. Three of these nests were completed but abandoned before laying. The interval between failed and replacement nests was from one to fifteen days.

Nest

Nests are built by the female and situated on the ground ($n=7$) or 40–100 cm above it (mean 70 cm; $n=7$) in bundles of sloping or bent-over tussock. Repeat nests were located an average of $3{\cdot}8 \pm 2{\cdot}0$ m (range 0·2–4·5; $n=7$) from failed nests. The nests are open (undomed) and oval or nearly circular. The average dimensions (cm) of five nests were: external length 11·7 (range 11·0–14·0); external breadth 10·0 (8·5–12·5); cup length 7·4 (6·5–9·0); cup width 6·4 (5·5–8·0); cup depth 4·9 (4·5–6·0). Nests are built entirely of tussock leaves, the base and walls with relatively long, broad leaves, the cup lined with shorter, finer ones. One nest, completed in four days, comprised 1287 tussock leaves distributed as follows (measurements in cm): base 418 leaves ($13{\cdot}4 \pm 7{\cdot}1$; range 3–54), cup 616 leaves ($8{\cdot}7 \pm 4{\cdot}8$; 3–40), lining 253 leaves ($5{\cdot}4 \pm 4{\cdot}0$; 1–18).

The female made an average of $8{\cdot}4 \pm 1{\cdot}1$ visits per hour to the nest during building. The duration of such visits was $1{\cdot}1 \pm 1{\cdot}1$ min (range 0·1–10·0; $n=170$). Trips to collect nest material averaged $2{\cdot}7 \pm 4{\cdot}9$ min (range 0·2–34·0; $n=162$). The distance travelled could be estimated on 78 occasions, and averaged $13{\cdot}5 \pm 9{\cdot}6$ m (range 0·5–40·0). Nest building took four ($n=1$) or five ($n=1$) days. On two occasions the male brought strands of tussock to the nest site, but the material was dropped when the bird sang from tussock above the nest. The male fed the female at the nest only once during nest building. At another nest, the female brought strands of tussock to the nest on one occasion on the 12th and 14th days of incubation.

Eggs

Tristan Bunting clutches comprise one ($n=2$) or two eggs ($n=10$). The eggs are pale blue with a light scattering of small faint brownish-purple spots at the sharp end and a variable amount of larger irregularly shaped spots concentrated at the blunt end where the ground colour may be completely obscured. Eggs average $24{\cdot}2 \pm 0{\cdot}9$ mm long (range 22·5–26·0;

$n=9$) and $17{\cdot}2 \pm 0{\cdot}9$ mm broad (16·5–19·0; $n=9$). The laying of the first and second eggs in two clutches was separated by maxima of 15·0 h and 16·5 h.

Incubation

The incubation period of 18 days was determined for one egg only. Incubation is undertaken exclusively by the female. Hagen (1952) presumed, on the basis of the presence of bare brood patches, that the male also incubated.

At one nest, watched for 11·7 h over six days from the day of laying to four days before hatching, the female spent 74·5% of the time on the eggs. The average duration of incubation sessions was $17{\cdot}4 \pm 13{\cdot}6$ min (range 3·0–43·8; $n=23$). Absences from the nest were an average of $6{\cdot}5 \pm 13{\cdot}0$ min (range 0·2–67·2; $n=27$). The incubating female was fed by her mate 17 times at the nest and seven times >1m distant. The overall daily feeding rate of the female by the male was $2{\cdot}8 \pm 1{\cdot}7$ per hour (range 1·9–6·2; $n=6$). The female was fed once *c.* 20 m from the nest by an unringed adult male (not her mate).

Another nest was watched for 32·5 h during incubation over 10 days up to two days before the eggs hatched. The laying date is unknown, but on the basis of an incubation period of 18 days, may be backdated to six days before observations commenced. The female spent 85·5% of this time on the eggs. Incubation sessions averaged $12{\cdot}9 \pm 8{\cdot}9$ min (range 0·2–42·7; $n=68$). Absences from the nest were an average of $3{\cdot}6 \pm 3{\cdot}4$ min (range 0·1–17·2; $n=77$). The male fed the female on the nest ($n=1$), in tussock directly above the nest ($n=70$), or further away up to 50 m distant ($n=18$). The daily average rate of such feeds was $2{\cdot}7 \pm 0{\cdot}8$ per hour (range 1·0–3·0; $n=10$).

Feeding was preceded by the male calling *chit* and the incubating female twittering softly in response, but louder when she left the nest and flew with the male to a feeding perch or if the male did not approach the nest. The male regurgitated food directly into the female's bill as she perched below or, once only, above him on a vertical or near vertical tussock stem. The female wing-quivered while soliciting food and being fed. The male often lingered to sing near the nest after feeding the female. If the female had not been fed for a relatively long period, she uttered a soft, enquiring *tchip* call from the nest. Thereafter she emerged and flew off or remained to forage on the ground or from the leaves of *Rumex* plants near the nest.

Nestling

The Tristan Bunting nestling apparently has not been described. An eight-day-old chick is described as follows:

Plumage. Ventral tracts: throat feathers creamy white with blue-grey base. Dorsal tracts: feathers ochreous dark olive with black centres, paling towards tail. Head down dark grey. Primaries nearly black; secondaries dark grey fading distally, tipped pale buff. Bill pale purple with off-white base and cutting edges. Gape flange pale yellow. Gape pale pink, tongue dark pink. Legs and feet pale purplish-brown. Skin pale flesh-pink. Iris dark brown.

Observations were made at the second nest (above) for 28·2 h over 13 of the 19 days of the nestling period from the day of hatching. The growth of

the two chicks is shown in Figures 1 and 2. The primary and secondary quills of the A chick sprouted 8 days after hatching. The flight feathers of the B chick, which hatched on the same day, remained in quill until 13 days after hatching. The eyes of the A chick had opened partially by the 8th day, and fully by the 12th day after hatching. Sixteen days after hatching its primaries and secondaries were well sprouted and dark brown with pale buff edgings. The wing coverts and tertials were broadly tipped buff. The spinal tract feathers were up to 6 mm in length and darkening at the base. The tail feathers had sprouted. The rear of the crown and nape were well-feathered and down remained only on the sides of the crown and sparsely on the lower spine. The B chick died 18 days after hatching, when it was 62% the mass of its sibling (which fledged the following day). The successful fledgling was fed by the parents for at least 3 days after leaving the nest.

For the first 3 days after hatching the two nestlings were fed either by the female alone or via the male, who transferred food to her in the same way as he did during incubation. Subsequent visits by the male were on his own or with the female. The overall feeding rate, averaged for each day, was $5{\cdot}7 \pm 1{\cdot}3$ feeds per hour (range 3·9–8·1; $n = 13$). Brooding of the chicks was by the female. The proportion of time spent brooding tended to decrease as the chicks grew older (Fig. 3). The average duration of brooding sessions was $6{\cdot}2 \pm 7{\cdot}4$ min (range 0·2–33·0; $n = 86$), again tending to decrease with increasing age of the nestlings. Absences from the nest by the female averaged $10{\cdot}5 \pm 9{\cdot}7$ min (range 0·2–40·5; $n = 88$), increasing as the chicks grew older.

Removal of faeces from the nest was first observed 7 days after the chicks hatched and up to 4 days before fledging. This activity was carried out mainly by the female (17 times, as against the male's 6).

Breeding success, mortality and predation

The fate of 14 eggs was determined; five hatched successfully, four failed to hatch, three were eaten by Tristan Thrushes and a c/2 was deserted, possibly because of heavy rain (65 mm in 24 h. The average daily rainfall in that month (November) was 9·8 mm; C. P. Siddall). Two of seven nestlings fledged successfully, one died of unknown causes, and four were eaten by Tristan Thrushes.

Tristan Buntings gave harsh *chick chzick* alarm calls and took cover in vegetation when Subantarctic Skuas *Catharacta antarctica* flew overhead. Tristan Buntings were recorded from only 0·1–0·2% of skua prey remains or regurgitates (Fraser 1984a, Ryan & Moloney 1991a), however, indicating that the skua does not severely affect the population as a whole. A female bunting alarm-called and took cover in tussock when a Swallow *Hirundo rustica* flew over. This is a rare vagrant to Inaccessible Island (Fraser 1984b) and presumably unfamiliar to the bunting. Tristan Thrushes prey upon bunting eggs, nestlings and fledglings (see also Ryan & Moloney 1991b). A female bunting attacked a Tristan Thrush which had approached to within 1 m of her nest, fluttering over the thrush and twice landing on its back and pecking it. The thrush then flew off and the bunting returned to her nest.

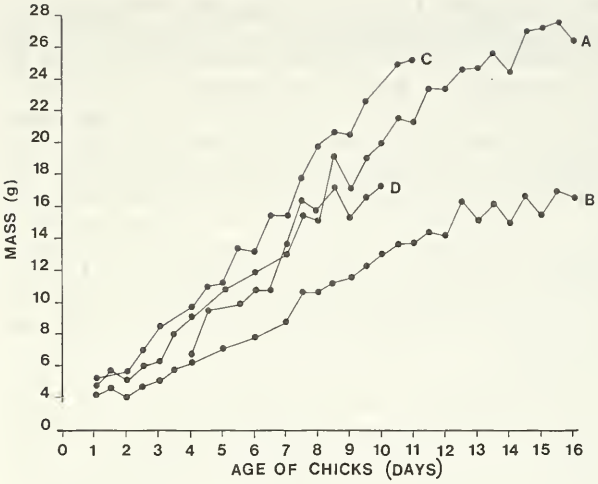

Figure 1 (above). Increase in mass of Tristan Bunting nestlings. Birds A and B are siblings; A fledged 19 days after hatching, B died 18 days after hatching. C and D were b/1; both were eaten by Tristan Thrushes.

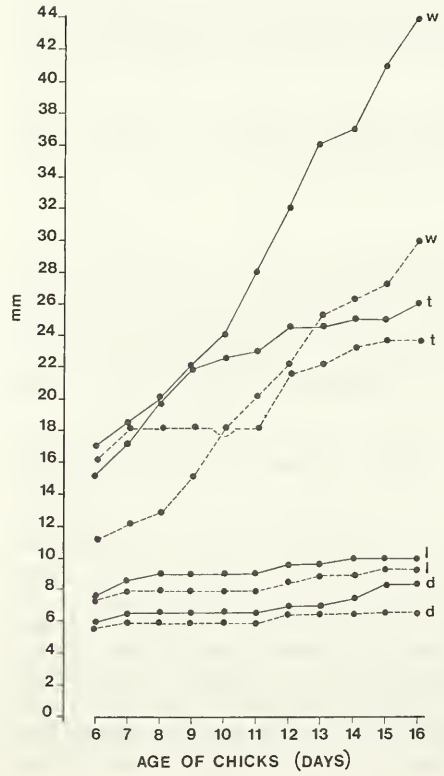

Figure 2. Increase in wing (w), tarsus (t) and bill lengths (l) and bill depths (d) of a brood of two Tristan Buntings. The A chick (solid line) fledged 19 days after hatching; the B chick (dotted line) died after 18 days.

Figure 3. Proportion of time spent brooding by a female Tristan Bunting. Stars indicate no data.

Morphology and taxonomy

The presence of age-related plumage phases in the Tristan Bunting is recognized (Hagen 1952). Previously undocumented, however, is the existence of two distinct and apparently habitat-related forms. In 1982–83 it was found that the plumages of birds on Inaccessible Island's summit plateau were distinctly brighter and richer in colour, at all ages, than those found at sea level and on tussock-clad slopes up to the edge of the plateau. The possibility that this represented age-related plumage variations was precluded by the discovery of 'upland' nestlings whose colouration differed markedly from that of 'lowland' nestlings. A brilliant yellow gape flange, deep pink mouth and a rich yellow suffusion to the skin, particularly on the belly, were the most striking features of the 'upland' nestlings.

A comparison of the nestlings of the two forms is given in Table 1. The 'upland' nestling was collected near North Point (*c.* 300 m a.s.l.) on 22 December 1982 and estimated to be 14 days old. The 'lowland' nestling from Blenden Hall was 16 days old.

Table 2 compares the plumages of 'upland' and 'lowland' breeding female Tristan Buntings. Both birds were collected on the nest, the 'lowland' at sea level at Blenden Hall on 4 February 1983, the 'upland' from the island plateau at *c.* 350 m a.s.l. on 11 December 1982. Adult males were not collected, but the 'upland' form was distinctly more brightly coloured than the 'upland' female and his lowland counterpart. We obtained very few mensural data of full-grown 'upland' buntings, but these indicated no differences between the forms (Tables 3 and 4). There appeared to be no differences in general habits that could not be explained by differences in, for example, vegetation composition (the lowland form feeds extensively on the seeds of *Spartina*, which is less abundant on the plateau). This distinct form has gone unrecognized because very few observations previously have been made on the island plateau. More importantly, specimens had not been obtained there previously, all having been collected at or near sea level in the lowlands or on coastal slopes where the bright birds, in our experience, do not occur.

The Tristan Bunting on Inaccessible Island is classified as the same race, *N. a. acunhae*, which formerly occurred on Tristan. However, there

TABLE 1
Comparison of 'upland' and 'lowland' forms of Tristan Bunting nestlings

Upland	Lowland
Head	
Down pale grey, quills dark slate-grey	Down grey, quills light blue-grey
Throat	
Yellow	Off-white
Breast	
Vivid yellow	Off-white
Back	
Feathers rich dark ochreous olive, centred black	Feathers dull olive, centred black
Thigh	
Yellow, quills slate-grey	Olive, quills blue-grey
Wing	
Primaries almost black; secondaries dark grey, fading distally, tipped pale buff; tertials dark grey, inner two tipped yellow-buff. Primary coverts almost black edged olive; greater coverts black with yellow tips and edges of outer webs; median and lesser coverts yellow-buff centred black.	Primaries dark with pale buff edging; secondaries washed-out grey, outer webs narrowly edged light olive; tertials washed-out grey, broadly tipped buff. Primary and median coverts dark brown, edged pale olive-grey; lesser coverts olive-brown edged olive.
Bare parts	
Upper mandible dark olive, cutting edge bright yellow, lower mandible bright yellow. Gape flange bright yellow, mouth deep rose pink. Legs and feet purplish-brown, claws tipped bright yellow. Skin pale pink with a rich suffusion of bright yellow, particularly on the belly.	Bill pale purple, base and cutting edges off-white. Gape flange off-white, mouth pink. Legs and feet pale purple, claws tipped off-white. Skin dark flesh pink.

exists only one specimen (the type) collected on Tristan, precluding taxonomic comparisons (Stresemann 1953). Nightingale birds *N. a. questi* are smaller in most respects than those from Inaccessible (Abbott 1978). The Nightingale form is described as racially distinct on this basis (Lowe 1923), although there is considerable overlap between the birds of both islands.

Wilkins' Bunting

Wilkins' Bunting is similar to the Tristan Bunting in colour, but is slightly larger and has a strikingly heavy bill. It is by far the rarer of the two species at Inaccessible.

Habitat and population size

At Blenden Hall, Wilkins' Buntings were observed in *Phylica* and, to a lesser extent, in tussock. They were rarely encountered on the island plateau, and then only in *Phylica*. The birds occurred singly or in pairs.

TABLE 2
Comparison of breeding female 'upland' and 'lowland' forms of Tristan Bunting

Upland	Lowland
General appearance	
Bright yellow underparts and rich olive green upperparts, faintly streaked	Dull, washed-out green, broadly streaked on back
Upperparts	
Crown rich olive-green, centred black. Forehead similar but more yellow. Nape, mantle and upper back feathers olive with faint dark central streak. Lower back and rump uniform unstreaked light olive.	Front of crown and centre of forehead greenish yellow with dark centres; sides of forehead yellow. Grey on lores and below eye. Feathers from central crown to lower back pale greyish-green indistinctly broadly-centred black. Rump feathers unstreaked.
Underparts	
Chin off-white. Rest of underparts rich cadmium yellow, brightest on throat and breast, paling slightly towards vent. Undertail coverts rich golden yellow.	Chin off-white, throat pale lemon-yellow. Rest of underparts pale washed-out yellow fading to almost white at vent; undertail coverts pale lemon yellow.
Wing	
Primaries almost black, outer webs narrowly edged rich yellow-olive. Secondaries and tertials almost black, broadly edged ochreous olive. Primary coverts almost black, edged pale olive. Small feathers almost black, broadly edged pale yellow-olive; lesser coverts broadly tipped olive.	Primaries dark grey with narrow greyish-yellow border, inner two bordered olive. Secondaries and tertials dark grey, broadly edged grey-green. Primary coverts dark grey edged greenish. Median and lesser coverts dark grey broadly edged dirty-olive.
Tail	
Dark brown with bright yellow outer webs, brightest at base of two outer tail feathers	Almost black, outer webs narrowly edged bright yellow
Bare parts	
Upper mandible dark grey, base yellow. Lower mandible bright yellow. Legs and feet pale brownish-purple, claws tipped bright yellow. Iris dark brown.	Upper mandible dark grey with paler cutting edge; lower mandible pale grey. Legs and feet dark brown, claws tipped off-white. Iris dark brown.

They were most often seen in *Phylica* (possibly just because they were more conspicuous there), but also foraged on the ground and amongst tussock and short ferns on Blenden Hall. One bird was captured in a walk-in trap (set for flightless rails *Atlantisia rogersi*) on the ground in dense tussock up to 2 m high.

Nine birds were mistnetted and uniquely colour-ringed in the *Phylica* grove at Skua Bog in November 1982. Eight of these birds were not seen again. An adult male remained there for at least 18 days, often in company with a female, presumably its mate. This high turnover indicates that some birds are mobile. The *Phylica* copse at Skua Bog represents the only relatively extensive area of this vegetation type at Blenden Hall (although

TABLE 3
Measurements of 'lowland' Tristan Buntings (linear measurements in mm, mass in g)

	Wing	Tail	Tarsus	Middle toe	Hind toe	Culmen	Bill width	Bill depth	Mass
					Adult males				
Mean	83.2	71.0	25.9	25.5	19.8	14.4	7.0	10.2	29.2
SD	1.7	4.0	1.3	1.3	1.6	0.5	—	0.3	2.6
Range	81–87	64–77	24–27.5	24–26.5	17.5–21	13.5–15	—	10–10.5	24.5–34
n	13	11	13	4	4	13	4	4	11
					Adult females				
Mean	80.6	66.6	24.4	24.7	19.0	14.6	7.5	9.2	27.9
SD	1.8	4.0	0.6	1.1	1.4	0.4	0.7	0.3	1.0
Range	79–83	61–72	24–25	24–25.5	18–20	14–15	7–8	9–9.5	26.5–29
n	5	5	5	2	2	5	2	2	5
					Unsexed subadults				
Mean	80.0	69.4	26.2	25.8	17.3	14.2	7.3	9.7	27.5
SD	1.4	3.3	1.7	2.4	0.3	0.7	0.6	0.6	2.9
Range	79–82	64–72	24–28	24–28.5	17–17.5	13–14.5	7–8	9–10	24–31
n	6	6	6	3	3	6	3	3	5

TABLE 4
Measurements of 'upland' Tristan Buntings (linear measurements in mm, mass in g)

Age and sex	Wing	Tail	Tarsus	Middle toe	Hind toe	Culmen	Bill width	Bill depth	Mass
Imm	80	68	23	25.5	17.5	13.5	8	8.5	29.5
Imm ♂	82	74	24	26.5	19	14.5	8	9.5	25.7
Ad ♀	82	71	23	24.5	17.5	14	7	9	33.0
Mean	81.3	71	23.3	25.5	18	14	7.7	9	29.4
SD	1.1	3.0	0.6	1.0	0.9	0.5	0.6	0.5	3.6

TABLE 5
Measurements of Wilkins' Buntings (linear measurements in mm, mass in g)

	Wing	Tail	Tarsus	Middle toe	Hind toe	Culmen	Bill width	Bill depth	Mass
					Males				
Mean	92	74.8	29.2	26	22	18.5	9.5	13.9	44.2
SD	1.7	3.4	0.6	2.3	1.6	0.3	0.6	0.5	1.9
Range	91–95	73–80	28.5–30	24.5–29	20.5–24	18–19	8.5–10	13–14.5	41–44.5
n	6	6	6	4	4	6	6	6	6
					Females/immatures				
Mean	92	79.2	29.2	28.3	22.0	18.9	9.2	14	42.3
SD	1.1	4.3	1.7	1.5	1.0	0.5	0.3	—	0.8
Range	91–93	73–82	27–31	27–30	21–23	18.5–19.5	9–9.5	—	41.8–43.5
n	4	4	4	3	3	4	3	3	4

isolated individuals and small groups of trees are thinly scattered amongst the tussock there), and is some 3 km distant and 500 m below the main areas of *Phylica* on the island plateau.

There are approximately 4·5 km^2 of sparse to dense *Phylica* woodland on Inaccessible, mainly in the northeast of the plateau. If Wilkins' Bunting occurs exclusively in *Phylica*, and the grove at Skua Bog (which supported a minimum of one pair) is representative of this vegetation type elsewhere on the island, then the population at Inaccessible may be in the order of 200 pairs. This may be larger if there is a mobile contingent, and if the birds are not wholly dependent upon *Phylica*. Elliott (1957) estimated 30 pairs of and 30 young Wilkins' Buntings on Nightingale in 1953. Later estimates by Elliott (in Vincent 1966–1971) suggested populations of 70–120 birds on Nightingale and 40–90 on Inaccessible. Richardson (1984) estimated 30 pairs on Nightingale in 1973–1974. The total population of Wilkins' Bunting has never been large, therefore, and may be in the region of *c.* 500 birds.

On the basis of the number of specimens collected Abbott (1978) concluded that Wilkins' Bunting was more abundant on Nightingale than Inaccessible, despite the larger area of the latter. This is unlikely to be the case, however, as the number of birds collected on Nightingale reflects rather the relative ease of landing on and access to the interior of the island and the consequently high number of scientific visits there compared to Inaccessible.

Food

The large bill of Wilkins' Bunting allows it, and not the relatively light-billed Tristan Bunting, to feed upon the hard fruits of *Phylica*. Wilkins' Buntings tested these with their bills, rejecting many and appearing to pluck and process the blackest (presumably ripest) ones. At Blenden Hall they also foraged in uniform stands of tussock, feeding from the seed heads or on the ground. The buntings methodically searched under and removed invertebrates from the leaves of *Rumex*. Hagen (1952) reported a variety of vegetable and invertebrate remains in stomachs of Inaccessible birds. In contrast, those on Nightingale appear to feed almost exclusively on *Phylica* and other fruits (Hagen 1952, Elliott 1957, Richardson 1984).

Breeding

No Wilkins' Bunting nests or eggs were found. Males defended territories at Skua Bog and sang from exposed perches from early November on Inaccessible. An adult feeding two newly fledged chicks was seen in January on the plateau (M. K. Swales, in Collar & Stuart 1985). Broekhuysen & Macnae (1949) collected a juvenile on Nightingale in March, indicating fledging in February. Elliott (1957) reports eggs and young at Nightingale in December and January and a fledged but dependent chick in early April.

Morphology and taxonomy

The measurements of 10 birds caught at Blenden Hall are given in Table 5. Our average figures are slightly larger in all respects apart from

bill width than three birds measured by Hagen (1952). Although wing-length and, particularly, mass are greater than those of Nightingale birds, our small sample suggests that the size difference between the races is perhaps not as marked as Hagen (1952) contends. Measurements of Nightingale birds given by Abbott (1978) are not comparable because of differences in measuring techniques.

The male of the Inaccessible race *N. w. dunnei* has not been described. One, captured at Blenden Hall on 8 November 1982, is described as follows. (A photograph of the head of this individual appears in Sinclair 1984, p. 336.)

Upperparts: Forehead and front of crown bright olive-yellow with black centres; rest of crown similar but less bright. Fairly conspicuous short bright yellow eyestripe. Lores and front of ear coverts greenish off-white. Nape dark olive, finely streaked black; back and mantle dark greenish-yellow finely streaked black. Rump dark greenish-yellow. Upper tail coverts slightly more greenish than rump. Outer webs of tail feathers bright yellow, inner webs pale yellow on outermost feathers, darkening to almost black on central ones. Underparts: Throat bright yellow. Upper breast slightly paler yellow; belly, flanks and undertail coverts similar but with a slight olive tinge.

Primaries uniform dark grey with bright yellow margin *c.* 1 mm wide on outer web. Secondaries as primaries but with broader yellow margin (up to 2 mm). Tertials generally darker with yellow margin broadening to 4 mm on inner tertial. Primary coverts as primaries with narrow faint yellow margin on both edges. Greater coverts darker than secondaries, with yellow reaching the quill at feather tip and up to 4 mm broad. Median coverts dark, tipped up to 5 mm with yellow and with black central stripe. Lesser coverts greenish-yellow, slightly less bright than medians. Underwing coverts pale yellow, dark at base; very sparse or almost absent.

Bare parts: Upper mandible dark, almost black with grey tip and cutting edge. Lower mandible slightly paler than upper. Iris dark brown. Legs dark purplish-brown; claws of front toes slightly darker than legs, hind claw almost black.

Rictal bristles absent; brood patch bare but unvascularised; large cloacal protuberance.

Measurements (mm): Total length 184; wing (flattened chord) 91; tail 87; culmen18; bill depth 13·5; bill width 11; tarsus 29; middle toe 24·5 (with claw of 3·0); hind toe 24 (with claw of 13). Mass 41·1 g

Wing formula: P1 minute, 11·5 mm <primary coverts; P2 −5 (=5 mm <wing tip); P3 −2; P4 −1; P5 longest=wing tip; P6 −2; P7 −5; P8 −9; P9 −12; P10 −14.

A territorial male at Skua Bog was often accompanied by a female Tristan Bunting, to which he displayed and followed into dense tussock 30 m from the edge of the *Phylica* grove. A bunting observed in *Phylica* on the island plateau near North Point displayed characters of both Wilkins' (short, deep-based conical bill, general colouration) and Tristan Buntings (relatively small size). These observations suggest that interbreeding between the bunting species may take place.

Conservation of Tristan and Wilkins' Buntings

The buntings of the Tristan group are of considerable scientific importance and of particular interest to evolutionary biologists. The islands and their landbirds represent a 'Galapagos in miniature' (Wace & Holdgate 1976, Collar & Stuart 1985), and Abbott (1978) notes that the islands display a 'simplicity which even the Galapagos lack' which would facilitate ecological and taxonomic research. The three forms of bunting also provide an interesting demonstration of variation within a population of such a small total range (Collar & Stuart 1985).

Within their range, Tristan and Wilkins' Buntings probably are under no immediate threat of extinction but are at permanent risk from the introduction of mammalian predators and alien plants (Collar & Stuart 1985).

The Tristan Bunting became extinct on the main island of Tristan da Cunha sometime before the end of the 19th century (Stresemann 1953, Bourne & David 1981, Collar & Stuart 1985). Here introduced Black Rats *Rattus rattus* and domestic cats *Felis domesticus* have been implicated in its demise. Habitat destruction, particularly of lowland *Spartina* tussock, probably also played a major part in the bird's disappearance. The coastal forelands at Edinburgh settlement, previously dominated by *Spartina* until at least 1824 (Earle 1832, p. 205), have been replaced by alien pasture grasses. Earle (p. 222) also describes the burning of 'underwood and grass' to create pastures at the 'east end of the island' (presumably Sandy Point). At Stony Beach, tussock apparently was the dominant vegetation until at least 1890, but by 1938 it had been completely destroyed by introduced cattle (Munch 1971, p. 227). The upland areas of Tristan, where the vegetation is similar to that of the Inaccessible plateau, on which buntings are numerous, remain largely unmodified by man. The extirpation of the Tristan Bunting from Tristan is likely to have been the result of a combination of anthropogenic factors, therefore, which would have similar consequences on Inaccessible.

Moseley (1892) makes brief mention of an attempt by Tristan islanders to reintroduce the Tristan Bunting to their island. Although no details are given, the exercise clearly failed. The reintroduction of the bunting to Tristan is an unrealistic goal as long as the factors which caused its extirpation there prevail. If grazing livestock were excluded from areas on the Tristan settlement plain, for example, then *Spartina* tussock could be re-established and provide potential habitat for Tristan Buntings. Nevertheless, reintroduction of the Tristan Bunting to the main island should probably be attempted only if the populations on the outer islands are threatened, as it would otherwise preclude the identification and study of an undiscovered relict population or natural recolonisation; either of which, although unlikely, may be remotely possible.

There is no evidence that Wilkins' Bunting has ever occurred on Tristan. The small population at Nightingale appears to be heavily dependent upon *Phylica* woodland (Hagen 1952, Elliott 1957). Any modification of this habitat will inevitably affect them adversely. In 1974 Tristan islanders felled 1 ha of *Phylica* while removing alien New Zealand Flax *Phormium tenax* (Richardson 1984). *Phylica* is also used as firewood by islanders visiting Nightingale to harvest seabirds, their eggs and guano. Harvesting parties may remain on Nightingale for three weeks or more (Richardson 1984). An alternative fuel source or some other form of control may be necessary to prevent over-exploitation of *Phylica*. The feasibility of cultivating *Phylica* as a fuel source and replacing any trees chopped down for burning may be worth investigating. Introduced House Mice *Mus musculus* feed on seeds of *Phylica*, and have been implicated in limiting its regeneration at Gough Island (Breytenbach 1986, Ryan *et al.* 1989). Great care must be taken, therefore, to ensure that mice, which are abundant on Tristan, do not reach the outlying islands.

The Tristan da Cunha Conservation Ordinance, 1976, provides for the protection of all species of bird at Inaccessible Island, with the exception of Rockhopper Penguin *Eudyptes chrysocome* and Great Shearwater *Puffinus gravis* which may be harvested there by Tristan islanders (Wace & Holdgate 1976, Grundy 1984). Such a concession is undesirable, however, because although harvesting of seabirds is virtually confined to Nightingale (Richardson 1984), traffic to Inaccessible would increase the likelihood of introducing alien organisms. Visits would also increase the possibility of other disturbances such as fire. Extensive burning of the *Spartina* tussock has occurred on Inaccessible (Rogers 1926), and must have at least temporarily reduced the bunting population through the destruction of nesting habitat and food plants. To avoid a repeat of the castastrophic modification of the vegetation and other harm caused by man and his commensals on Tristan da Cunha, the prohibition of agricultural activities on Inaccessible (Section 3·3 of the Conservation Ordinance; Wace & Holdgate 1976) must be maintained. Indeed, any potential value which Inaccessible may have for agricultural and other human development must be weighed against its scientific and conservation importance as one of the most unspoilt oceanic islands.

Inaccessible still lacks nature reserve status, despite calls for it to be so declared (Collar & Stuart 1985 and references therein). Such formal declaration is highly desirable for the buntings, the island's other landbird species and its seabird colonies (Collar & Stuart 1985, Fraser *et al.* 1988). Inaccessible is also worthy of registration within the World Heritage Convention of 1972.

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The range of *Malimbus ibadanensis*

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The rediscovery of *Malimbus ibadanensis* by J. S. Ash in November 1987 (Elgood 1988) has resulted in a need for reconsideration of the species' probable range. Although Ash's rediscovery was also at Ibadan and only *c.* 5 miles from the type locality (Elgood 1958), recent sight records of males only of *M. cassini* in Ghana (Grimes 1987) raise the question of the true identity of these Ghana birds. Males of *M. cassini* and *M. ibadanensis* are thought to be indistinguishable in the field, though the females are quite distinctive: that of *cassini* being entirely black, while that of *ibadanensis* has conspicuous red on head and throat. Bannerman (1949) mentions sight records of "*cassini*" from Nigeria by S. Marchant in Owerri Province (east of the Niger) and by H. F. Marshall at Ibadan.

With the establishment of *ibadanensis* as a distinct species (Elgood 1958), it seems likely that Marshall had earlier discovered this new species